Animal Industry Report

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Comparison of an Experimental Teat Sealant vs. Commercial Dry Period Barrier Teat Sealant Dip on Teat Coverage Persistency and Teat Health

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Summary and Implications

Mastitis research has shown 40-50% of intramammary infections (IMI) are contracted during the dry or non-lactating period with greatest percentages occurring during first and last two weeks of dry period. The ability to develop and apply external persistent barrier teat dip products that can persist for these 1 week periods could decrease IMI, thus improving animal health and performance, and product quality and safety. Objective of this study was to evaluate an experimental sealant product vs. commercial persistent barrier dry cow teat sealant dip with particular interest and comparisons of dip persistency in providing teat end protection, and overall teat end and skin health.

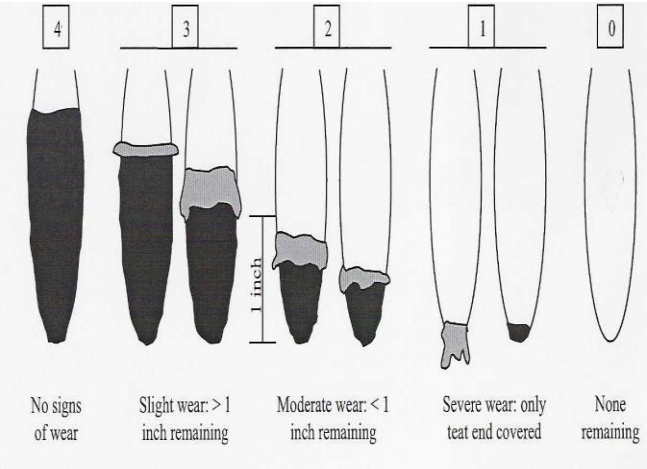
Two external teat sealants were applied to 24 animals for assessment of adherence to teat skin/teat end over a period of fifteen days. Overall, substantially better coverage was observed for teats treated with the experimental product compared to control product over the first week after application. By the third day, the experimental product was 22 times more likely to have teats protected than the control product. By day four, this likelihood increased to 56 times. Product was observed on teats with the experimental product until day 10, while no product was visible by day 5 on teats treated with the control product. The study showed that the experimental product stayed on teats much longer than the control product, with around 50% teat ends protected five days after initial application.

Introduction

Mastitis research has shown that 40-50% of intramammary infections (IMI) are contracted during the dry or non-lactating period with the greatest percentages of these occurring during the first and last two weeks of the dry period. At these times, the mammary gland is in a transitional state. Immunological factors are preoccupied or suppressed, milk is not being flushed from the gland, and increased mammary pressure distends the teat, thus allowing for easier bacterial penetration through the streak canal. Both external persistent sealant (2-5 day adherence) dips and internal teat sealants have been developed and shown to decrease IMI rates, especially environmental mastitis, in dry cows/ springing heifers during the early dry and late prepartum periods when used properly. The ability to develop and apply external persistent barrier teat dip products that can persist for these 1 week periods could decrease IMI, thus improving animal health and performance, and product quality and safety. Objective of this study was to evaluate an experimental sealant product vs. commercial persistent barrier dry cow teat sealant dip with particular interest of dip persistency in providing teat end protection, and overall teat end and skin health.

Materials and Methods

1. **Sealants used**: 2 sealants were used in this trial. One sealant was an experimental product (DeLaval) while the control dip was a commercial dry cow sealant product (Dry Off, GEA).
2. **Cows**: All protocols were approved by the ISU Committee on Animal Care. 24 dry cows were used for the study. Cows were housed in a free stall barn with sand bedding and headlocks on the south side of the ISU dry cow barn. Cows were fed and locked up at 6:30 am July 26, 2016 and then observed daily for 15 days (Aug 9). Products were applied on the morning of July 26. Animals enrolled in the trial were on average 4.6 ± 1.6 years old and had been dry for 18.4 ± 11.5 days at the start of the study.
3. **Animal ID and teat health evaluation** (initial and final): 24 dry cows in lockups were visually identified by eartag. All teats of all animals were cleaned and dried with terry cloth towels. Teats were pre-dipped first with a 350 ppm chlorine predip and then dried with a microfiber towel. Individual teat ends and teat skin for every animal were evaluated by one scorer at this time (initiation of trial) and again once the dip had completely been removed from the teat following dipping (final evaluation). Comparisons between dips were conducted.
4. **Sealant application**: A total of 48 quarters were assigned to each treatment, and each treatment had an equal number of quarters (n = 12) assigned to a quarter location (LF, RF, LR, RR). Contralateral front and rear quarters were dipped with one sealant, while the other sealant was put on the other contralateral front and rear quarter. An example is shown in Figure 1.
5. **Teat dip persistency evaluation**: Teat dip persistency or coverage of teats (especially teat ends) was conducted every 24 hours. Teat dip coverage was scored using a 0-4 scale: (4= complete teat adherence similar to originally dipped; 3 = dip starting to peel but on ¾ of teat; 2 = 50% of teat covered; 1 = teat end only covered; and 0 = dip completely off. Observations on dip shearing, flaking, or tearing were also recorded.



6. **Statistical analysis:** Multinomial regression was used to test the differences in the proportion of teats in the different adherence scores (4, 3, 2, 1, and 0) 1 to 4 days after application, using the GENMOD procedure of SAS (version 9.4). The experimental product was compared relative to the control product Dry-Off®. Statistical significance was set at 0.05. The odds ratio (OR) were calculated for each comparison. Data analyses are presented for adherence of both products on teats for up to four days. This is because no teats were protected in the control group from day five onwards, making statistical comparison impossible. However, cows were monitored for up to fifteen days and the raw data is presented here. Also, four cows had data for up to four days only because they were moved to another pen. Their data was included in the analyses.

Results and Discussion

1. **Teat end and teat skin health**
   - There were no differences among dips with regards to teat skin and end health. All teats had excellent teat skin and end health before dipping and after dip removal. All teats had a teat skin condition score of 1 at the start and end of the study. All but one cow had teat end condition score of 1 on all teats. The remaining cow had teat end scores of 1.5 on all quarters.

2. **Teat dip persistency and coverage:** Descriptive data and OR values are shown in Tables 1 and 2 and Figure 2. Results showed that in general, the experimental product was 27 times more likely to have a higher number of teat end covered, compared to the control product (CL = 15.3 – 48.4, P<0001). After 1 day, 100% teats in the experimental group were covered while it was only 83% for the control group. It was 19 times more likely that teats treated with the experimental product had better coverage than Dry-Off® by day 1. After two days this likelihood increased to 23 times, as the experimental product had 92% teats covered while only 48% of the control teats were protected. By day three the likelihood was 22 times in favor of the experimental product, with 77% teats protected in the experimental group compared to the control product, at 19%. By day four, the likelihood increased to 56 times because 69% teats were still protected in the experimental group compared with the control product, at 4%. By day five, all control teats had lost the teat end protection while 48% teats were still protected in the experimental group. The last day when teats were observed with protection in the experimental group was day 10, with 4% teat ends protected.

Overall Summary

Objective of this study was to evaluate an experimental vs. commercial persistent barrier dry cow teat sealant dip with particular interest and comparisons of dip persistency in providing teat end protection, and overall teat end and skin health. Two external teat sealants were applied to 24 animals for assessment of adherence to teat skin/teat end over a period of fifteen days. Overall, substantially better coverage was observed for teats treated with the experimental product compared to control product over the first week after application. By the third day, the experimental product was 22 times more likely to have teats protected than the control product. By day four, this likelihood increased to 56 times. Product was observed on teats with the experimental product until day 10, while no product was visible by day 5 on teats treated with the control product. The study showed that the experimental product stayed on teats much longer than the control product, with around 50% teat ends protected five days after initial application.

Table 1. Adherence of external teats sealants on teats of dry cows over a period of 15 days after initial application.

Treatment		Quarters (n)					Coverage*
	Days	Score 4	Score 3	Score 2	Score 1	Score 0	
Patch (n = 48)	1	41	5	2	-	-	48 (100%)
	2	29	13	2	-	4	44 (91.7%)
	3	16	18	1	2	11	37 (77.1%)
	4	8	19	6	-	15	33 (68.8%)
	5	1	13	8	1	25	23 (47.9%)
	6	-	7	7	4	30	18 (37.5%)
	7	-	4	5	5	34	14 (29.2%)
	8	-	4	4	2	38	10 (20.8%)
	9	-	1	2	4	41	7 (14.6%)
	10	-	-	-	2	46	2 (4.17%)
	11	-	-	-	-	48	0 (0%)
	12	-	-	-	-	48	0 (0%)
	13	-	-	-	-	48	0 (0%)
	14	-	-	-	-	48	0 (0%)
	15	-	-	-	-	48	0 (0%)
Dry-Off® (n = 48)	1	10	20	4	6	8	40 (83.3%)
	2	2	12	1	5	28	20 (41.7%)
	3	1	2	4	2	39	9 (18.8%)
	4	-	1	-	1	46	2 (4.2%)
	5	-	-	-	-	48	0 (0%)
	6	-	-	-	-	48	0 (0%)
	7	-	-	-	-	48	0 (0%)
	8	-	-	-	-	48	0 (0%)
	9	-	-	-	-	48	0 (0%)
	10	-	-	-	-	48	0 (0%)
	11	-	-	-	-	48	0 (0%)
	12	-	-	-	-	48	0 (0%)
	13	-	-	-	-	48	0 (0%)
	14	-	-	-	-	48	0 (0%)
	15	-	-	-	-	48	0 (0%)

Table 2. Odds ratio (± CL) in teat coverage over the first four days after application experimental product vs. Dry-Off®

Days	OR*	Lower CL	Upper CL	*P* value
1	19.2	7.3	50.3	<0.001
2	23.2	10.0	53.7	<0.001
3	21.9	8.7	55.1	<0.001
4	56.4	12.4	256.5	<0.001

**Odds ratio is the coverage odds in the experimental group divided by the coverage odds in the control group

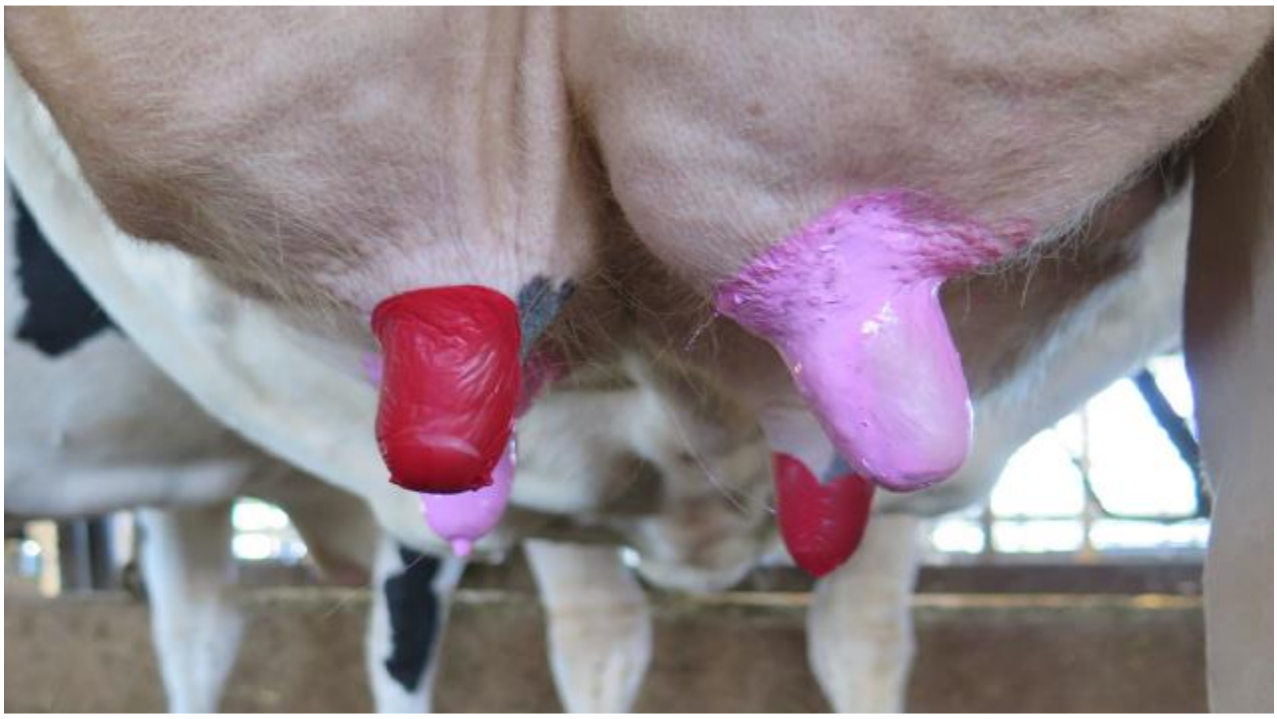


Figure 1. Adherence of products on teats at day of application (light pink = GEA Dry Off[R]; , red = Delaval experimental)

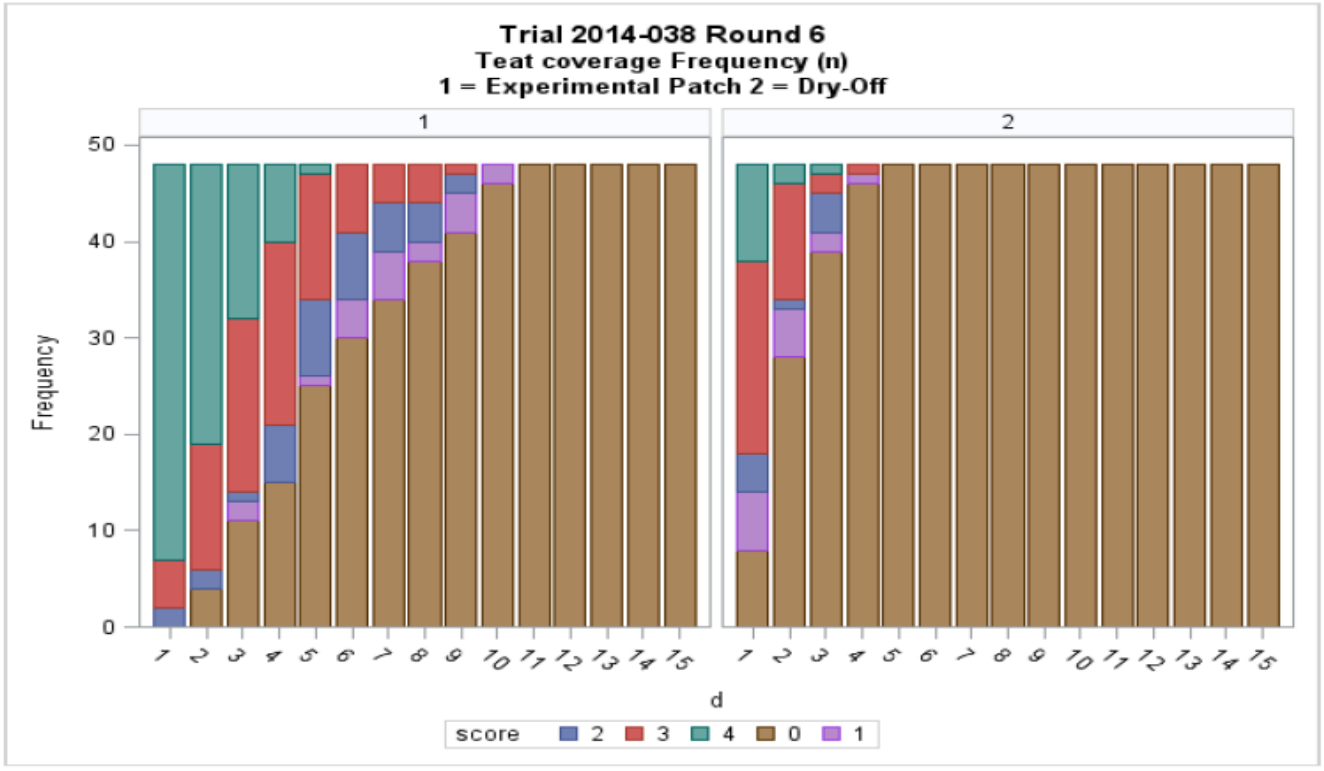


Figure 2. Teat coverage by external teat sealants over a period of 15 days. (4 = full coverage, 3 = ¾ of teat, 2 = ½ of teat, 1 = ¼ of teat, 0 = completely removed and/ or no protection of the teat end. Scores 1-4 are evidence of teat end protection.